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ABSTRACT

A study was conducted to evaluate inequalities in salary for all regular faculty, administrative, and staff employees with respect to gender and ethnicity at a major metropolitan research university. In all, there were 648 minorities in the study and 1,443 women. Three approaches were used to test for inequalities: (1) a multiple regression analysis; (2) a General Linear Model approach; and (3) a 10% deviation flag. The study reviewed the methods used, why they were used, and the process used to synthesize the results. The paper also highlights the difficulties in developing appropriate criteria for assessing salary equity and treating issues of "practical" significance as compared with "statistical" significance. The goal of the study was to determine if there were any causes of concern relating to salary equity in regard to gender and ethnicity. A second reason was to begin establishing a procedure for the ongoing analysis of salary equity. Findings show no cause for concern for 9-month faculty, but do show inequalities for administrative and staff categories. No in-depth statistical analysis of causes for these differences was possible. (SLD)

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A Three-Pronged Approach To Evaluating Salary Equity Among Faculty, Administrators, And Staff At A Metropolitan Research University

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A Three-Pronged Approach To Evaluating Salary Equity Among Faculty, Administrators, And Staff At A Metropolitan Research University

Abstract

A study was conducted to evaluate inequalities in salary for all regular faculty, administrative, and staff employees with respect to gender and ethnicity at a major metropolitan research university. Three approaches were used to test for inequalities: a multiple regression analysis, a General Linear Model approach, and a 10% deviation flag. This paper will review the methods used, why they were used, and the process used to synthesize the results. The paper will also highlight the difficulties in developing appropriate criteria for assessing salary equity and treating issues of "practical" significance as compared with "statistical" significance.

A Three-Pronged Approach To Evaluating Salary Equity Among Faculty, Administrators, And Staff At A Metropolitan Research University

A study was conducted to evaluate inequalities in salary for all regular faculty, administrative, and staff employees with respect to gender and ethnicity at a major metropolitan research university. Three approaches were used to test for inequalities: a multiple regression analysis, a General Linear Model approach, and a 10% deviation flag. This paper will review the methods used, why they were used, and the process used to synthesize the results. The paper will also highlight the difficulties in developing appropriate criteria for assessing salary equity and treating issues of "practical" significance as compared with "statistical" significance. The goal of this study was to determine if there were any causes of concern relating to salary equity in regard to gender and ethnicity. Secondarily, this study was to begin establishing a procedure for the ongoing analysis of salary equity.

Background

The President's Commission on the Status of Women was created in September 1998 "to assess and recommend policies, practices, and procedures that improve and ensure an equitable educational, professional, and social environment in which the full participation of members of women is supported and the contributions of women are valued." (CSW 2000) This draft report identified pay differences based on gender for several categories of administrative and staff employees. This early draft report also recommended that the university conduct an "Equal Pay Self-Audit". Step 2 of this audit is to "evaluate your compensation system for internal equity." Based on these initial observations, the President and Provost requested a more detailed salary analysis to evaluate relevant factors related to salary equity for university employees.

The initial Commission findings were included in its final report. In addition, , the President had also established a Commission on the Status of Racial and Ethnic Minorities that

released a report in late 2001 that included some salary equity recommendations. In addition , the Office of Federal Contract Compliance Programs (OFCCP) can also require a study of compensation of women and minorities.

The primary objective of the study was to evaluate salary "equity" for university employees using selected factors. In addition, an objective was to identify an appropriate methodology that could be used on a repeatable basis as a standard practice at the university. The scope of the study included university faculty, administrative, and staff employees. However, it considered only regular salaried employees and did not include OPS (temporary) employees. The study used current salary distributions only and used an internal basis for comparison. It was anticipated that an external market comparison would be conducted in the future.

The following definitions were used as guidelines in this study:

- ***Equity*** addresses an ideal state of being impartial, fair, or just. The immediate question is whether data suggest that gender or ethnicity alone is associated with salary levels that are partial, unfair, or unjust.
- ***Inequality*** suggests not the same in any measurable aspect. Lack of equality, as of opportunity, treatment, or status.

This salary study identified salary inequalities. Where they exist, further analysis is required to assess equity.

Previous Models and Approaches

There is a long history of models and analytical approaches that have been used to address possibilities of salary equity based on various factors. Most of these models have been regression-based and have focused on identifying differences based on gender or ethnicity. McLaughlin and Howard (2001) provided a good overview of the different methods and references for conducting faculty salary studies. Strathman (2000) examines an alternative consideration of faculty rank in those studies and provides an additional set of references that

cover a range of models. Toutkoushian (2000) focuses on the less treated issue of examining nonfaculty salaries with an extensive list of references. More recently, Sun (2002) developed a new approach for determining faculty salary adjustments.

These models use underlying regression approaches that require a reasonable "sample" size (even though it is the existing population or sub-population that is being examined). When the sample sizes become small, there is a limit on the number of variables that can be included in the regression. In addition, a combination of varying salary levels and small sample sizes results in large standard errors that may mask very real salary differences. This latter problem is not addressed in the literature.

A major focus of this study is to be able to identify those real (possibly not statistically significant differences) salary differences. The three level approach attempts to meet that need. The following sections describe the background and the development of the approach. Selected results are included to illustrate how the results can be presented and used by decision makers.

Data and Compensation Related Factors

Data—Problems and More Problems

The July 1999 salary extract data used by the Women's Commission included OPS and incorrect values for key elements. It was determined that the critical factors for an internal equity study were accurate salary, rank/level, and department affiliation. Based on these factors, the EEO Director and IR Director recommended the EEO-6 file. It is built from budget, personnel, and payroll files and created after October 1 raises are applied.

However, it was discovered that even the 1999 EEO-6 file had data problems. An extensive effort was required to "clean" the data file. In 1999, the file was saved in the middle of applying raises so the 1999 Salary Study uses the maximum of the base rate plus the sum of the salary increments and the current rate.

In 1999, there were 2,802 records in the file. Ten records were deleted from evaluation for insufficient data. Twenty-eight outliers were deleted from study based on a 3-sigma evaluation at the pay plan level. This resulted in 2,764 records used in the analysis.

Independent (Predictor) Variables

Analysis was conducted to determine differences in salary between men and women and between whites and minorities. The factors considered for analysis are listed below. Those in italics were the primary factors used in this analysis.

- *salary (9 month, 12 month)*
- *administrative unit*
- *gender*
- time in grade
- *ethnicity*
- time since degree
- *rank/level*
- *pay grade*
- *HEWcode*
- *length of employment at UCF*
- *age*
- performance evaluations
- *discipline (college)*
- special awards (e.g., TIP, PEP)
- *department*
- market characteristics

The primary method used for categorizing employees was pay plan. The four pay plans were 9-Month Faculty (instructional), 12-Month Faculty (administrative), A&P (Administrative and Professional staff), and USPS (University Support Personnel System, staff).

9-month faculty are primarily instructional faculty and their salaries were reported as 9-month salaries except when all employees were aggregated together. 12-month faculty are primarily administrative faculty. Any 9-month faculty members (including deans) recognized to

be "administrative faculty" were converted to a 12-month faculty salary and will be classified as a 12-month faculty member for purposes of this study.

Rank (i.e., professor, assistant professor, etc.) was used to classify faculty. HEW code was used to determine the "level" for A&P and USPS employees. Pay grade was used to further define A&P and USPS employees. Five colleges and the CREOL were used to cluster "academic" employees together. The department and administrative unit codes were used to cluster the "administrative" units into 13 groups.

In the final models, analyses were conducted by pay plan. The primary variables were age, years at UCF, minority status (1= white, 0=minority), gender (1=male, 0=female), rank, hewcode, and pay grade. College/division was included either within the model or as separate models. Strong correlations existed among several variables: age, years at UCF, years in rank, years in class, years in degree, and years in state. In order to reduce the effects of multicollinearity, only age and years at UCF were added to the model.

Methodology

All analyses were conducted by pay plan. Pay plan was the primary method of categorizing employees. Again, the four pay plans were 9-Month Faculty (instructional), 12-Month Faculty (administrative), A&P (Administrative and Professional Staff), and USPS (University Support Personnel System). For purposes of describing the methodology, 9-Month Faculty results are shown. Notations are made where methodology differs for staff.

Population

The first step in the analysis was to identify the population under study (Table 1). Overall, there were 648 minorities in the study and 1,443 women. The table also shows the population of each of the four pay plans.

Table 1

Population

Female/Male Total	Black	Hispanic	Other	Total Minority	White	Total
9-Month Faculty	25/17 42	18/22 40	24/78 102	67/117 184	249/405 654	316/522 838
12-Month Faculty	7/7 14	4/5 9	4/21 25	15/33 48	108/184 292	123/217 340
A&P	19/14 33	20/13 33	11/3 14	50/30 80	178/155 333	228/185 413
USPS	104/39 143	99/42 141	29/23 52	232/104 336	544/293 837	776/397 1,173
Overall	155/77 232	141/82 223	68/125 193	364/284 648	1079/1037 2,116	1443/1321 2,764

College/Division Analysis

A General Linear Model (GLM) analysis (GLM methodology discussed in more detail below) was run for the nineteen college/divisions by pay plan. Statistically significant results for 9-Month Faculty were:

- Creol has a higher average salary than 5 other units
- Business and Engineering have higher average salaries than Arts & Sciences, Education, and Health & Public Affairs

Thus, there are significant differences in salary between colleges and must play a role in the analysis. In particular, the GLM and Flag approaches are factored on college/division. Furthermore, the results of the college/division GLM analysis were used to group college/divisions with similar average salaries together when running some regression models. For example, all of the colleges and divisions were grouped into four categories to run regression analyses for 12-Month Faculty.

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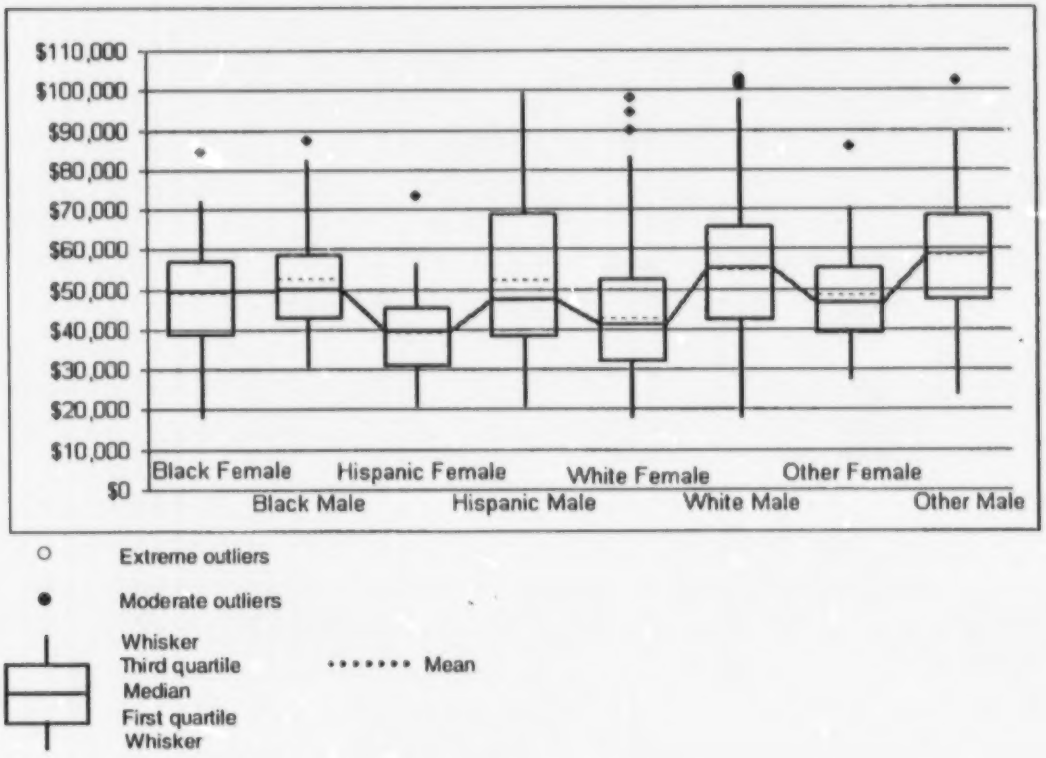
Overall Results

Box plots were created for the overall mean and median salaries by pay plan. The figure below shows means, medians, variability, and outliers by gender and ethnicity for 9-Month Faculty. From the plot, it is obvious that without taking into account information such as rank and college, female salaries are lower than male salaries for all ethnic groups. You can see why looking at the salaries on an aggregate level could raise red flags with the Commission on the Status of Women. Comparison of means or medians can provide a high level summary but they overlook factors contributing to differences. Comparing means and medians are more useful for well-defined groups with similar characteristics.

Figure 1

9-Month Faculty Box Plot



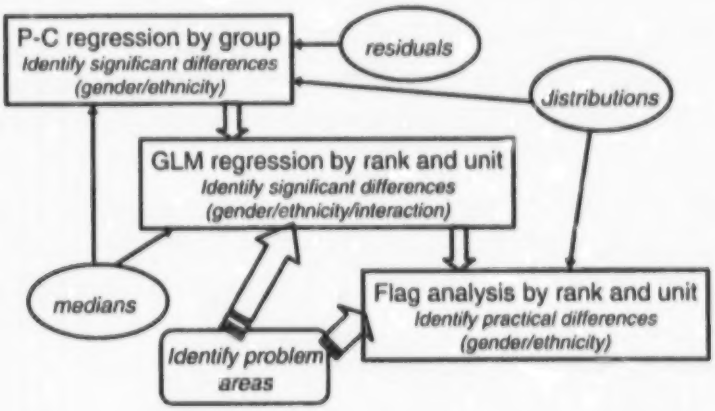
Analysis

The salary data represent a census. As such, no statistical analysis is required. However, multiple approaches were used. For the first two approaches, the data was treated as a sample and statistical analyses were conducted. First, regression analyses were applied to academic unit and pay plan groupings. Second, General Linear Models (GLM) were applied to unit/rank elements. The third approach, a non-statistical parallel to regression/ANOVA model, looks at the percentage difference from the average salary to "flag" larger differences in average salaries.

The figure below depicts the flow of the three approaches. A prediction-comparison (P-C) regression approach was conducted by pay plan and group. It is used to identify significant differences. Statistical tests are conducted on the residuals, distributions, and median salaries. From there a more detailed analysis is conducted using GLM regression models (ANOVA) by rank and unit to identify statistical differences. Statistical tests are also conducted on median salaries at this level. Finally, a flag analysis is used at the same level as the ANOVA analysis, by rank and unit, to identify practical differences that may be masked by small sample sizes and large variances. Statistical tests are also conducted on the individual distributions at this level. More details on all three approaches can be found in the sections that follow.

Figure 2

Methodology



Multiple Regression

SPSS *Clementine* data mining software was used to test a regression approach, a neural net approach, and a best rule approach. All approaches were achieving about a 70% prediction. The decision was made to use a regression approach using Excel 2000 since regression analysis is

a commonly used approach for salary studies. A model is created for a base class and prediction values are compared with actual values for individuals in the comparison class.

In a single-equation approach,

Salary =f(rank, discipline, gender, ethnicity, age, years of service),

all variables are included in a single model including gender and ethnicity. Toutkoushian's study in 2000 discusses the limitations of this approach because of assumptions that each variable in the model must have the same effect on all individuals, and it restricts all women and minorities to having the same level of pay disparity [Toutkoushian, 2000].

Test on this university's data indicated that the regression models were not reliable with both rank and discipline as independent variables. There were too many rank/levels and colleges/divisions and too few individuals to result in reliable models. In order to include discipline, it was necessary to conduct analyses for separate disciplines (colleges/divisions) or groupings.

So the first approach used was a regression based analysis by discipline (college) or grouping. A prediction-comparison (P-C) approach was used. A no discrimination wage structure (base model) was developed. Wages were predicted for the comparison group and those predicted wages were compared to actual wages.

Specifically, a model was developed for male employees and then the salary of females were evaluated with that predicted for a male employee with the same characteristics. The faculty and staff functions are listed below.

- Faculty Salary =f(rank, ethnicity, age, years of service at UCF)
- Staff Salary =f(hewcode, paygrade, ethnicity, age, years of service at UCF)

A model was also developed for White employees and then the salary of minorities were evaluated with that predicted for a White employee with the same characteristics. The faculty and staff functions are listed below.

- Faculty Salary =f(rank, gender, age, years of service at UCF)
- Staff Salary =f(hewcode, paygrade, gender, age, years of service at UCF)

This approach is based off the literature of Oaxaca, Oaxaca (M) method, Scott, Best White Male Model, and Snyder, Hyer, and McLauglin, residuals.

Multiple models were created for each of the four pay plans. A model was created for each of the six colleges to analyze the 9-month faculty. Four models (two academic groupings and two administrative groupings) were created to evaluate 12-month administrative faculty. Results from the college/division GLMs were used along with their mean salaries to group the 19 colleges and divisions into the four groupings. Additional variables included in the faculty models included age, years at the institution, either gender (for minority models) or race (for gender models), and rank. Three models (one academic and two administrative groupings) each were used to evaluate A&P and USPS employees. Again, the results of the college/divisions were used to establish the three groupings, which varied for the two pay plans. Additional variables in the staff models included age, years at the institution, either gender (for minority models) or race (for gender models), level, and pay grade.

For each regression model, a two-sample t-test was calculated to test differences in the mean residuals for males (whites) and females (minorities). This computation identified whether females or minorities were paid significantly different, on average, than would be expected if they were male or white. However, caution should be used when evaluating the models since large standard errors may mask practical differences.

Additionally, the number of males (whites) and the number of females (minorities) with actual salaries greater than two standard errors away from their "expected" salary were computed. The number of individuals between one and two standard errors away from their "expected" salary, as well as those with actual salaries within one standard error away from their "expected" salary was also computed. Thus, a distribution of individuals with salaries above and below expected were created. A Chi Square test was computed on these distributions to determine if the distribution of male (white) salaries was significantly different than the distribution for females (minorities).

Furthermore, a Mann-Whitney Rank Analysis (Rank Sum Test) was conducted to determine if the median salary for males (whites) was significantly different than the median salary for females (minorities).

The three tables below show the results of the regression analysis for 9-Month Faculty. A total of twelve (12) regression models were created to evaluate 9-month instructional faculty. One model for males and one model for whites were created for each of the six colleges. Variables used include age, years at UCF, gender (for ethnic model) and ethnicity (for gender model), and rank. The models are displayed in Table 2 below. The adjusted R^2 ranged from .49 to .80. The standard error ranged from 6,187 to 8,987. Significant factors at the .05 significance level are shaded gray in the table below.

Table 3 shows the results of the residual t-test, along with the mean residual for each 9-Month Faculty model. The results of the t-test show that females were paid more in Health & Public Affairs and minorities were paid more in Arts & Sciences, Education, and CREOL. The Chi Square results, Table 4, show males and females have significantly different distributions in Arts & Sciences and Health & Public Affairs and whites and minorities have significantly different distributions in Education and Creol. The Mann-Whitney Rank Sum Results, also in

Table 4, show that males have a higher median salary than females in Arts & Sciences, Business, Education, and Creol. No significant differences were found in median salary with respect to ethnicity among 9-month faculty.

Table 2

9-Month Faculty Regression Models

	Arts & Sciences		Business		Education		Engineering		Health & Public Affairs		CREOL	
	Gender (Male)	Ethnicity (White)	Gender (Male)	Ethnicity (White)	Gender (Male)	Ethnicity (White)	Gender (Male)	Ethnicity (White)	Gender (Male)	Ethnicity (White)	Gender (Male)	Ethnicity (White)
Adjusted R^2	0.73	0.79	0.74	0.80	0.68	0.78	0.61	0.49	0.71	0.70	0.68	0.75
Standard Error	8,987	7,926	6,769	6,700	8,259	6401	6,187	6,691	7,078	7,447	8,481	8,468
Intercept	36,982	33,408	54,806	44,238	36,625	31,509	51,878	63,781	41,175	40,476	32,096	821
Age	74	43	-277	-116	94	7	-205	-264	-87	-48	717	1,436
Years at UCF	-1	86	-259	-121	-8	228	36	40	-109	61	305	2,282
Male	N/A	311	N/A	-3,510	N/A	512	N/A	-769	N/A	-3,600	N/A	-12,767
White	-2681	N/A	-3,987	N/A	-8,816	N/A	-352	N/A	-2,123	N/A	-4,733	N/A
Professor	29,648	29,577	54,016	53,143	35,131	30,098	32,053	22,794	36,262	35,826	20,457	1,542
Assoc. Prof.	14,280	14,826	32,791	33,408	18,888	16,088	18,735	10,336	20,139	17,710	4,861	-10,778
Assist. Prof.	2534	4,800	24,112	27,613	7,370	6,977	7,560		9,894	9,225		
Instructor	-13,265	-11,541										
Lecturer	-6,775	197										

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Table 3

9-Month Faculty Summary Results

		n-size	Chi Square	Rank Sum	Unequal Variance	Mean Residual	t-Test
Arts & Sciences n=(379)	Male	243	0.000	0.000	0.000	-576	0.235
	Female	136					
	White	295	0.152	0.956	0.050	1887	0.958
	Minority	84					
Business n=(116)	Male	80	0.142	0.011	0.176	193	0.543
	Female	36					
	White	96	0.852	0.093	0.178	1258	0.722
	Minority	20					
Education n=(111)	Male	46	0.087	0.008	0.013	-660	0.311
	Female	65					
	White	97	0.000	0.411	0.171	6775	1.000
	Minority	14					
Engineering n=(90)	Male	77	0.930	0.931	0.252	-356	0.419
	Female	13					
	White	58	0.617	0.202	0.147	-1548	0.124
	Minority	32					
Health & Public Affairs n=(124)	Male	60	0.031	0.805	0.094	3239	0.992
	Female	64					
	White	97	0.761	0.676	0.436	1856	0.880
	Minority	27					
Creol n=(18)	Male	16	0.717	0.042	0.342	2212	0.666
	Female	2					
	White	11	0.050	0.928	0.006	17001	0.988
	Minority	7					

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Table 4

9-Month Faculty Chi-Square and Rank Sum Details

		n-size	Median	>2 SE Below	1-2 SE Below	Mid	1-2 SE Above	>2 SE Above	Chi Square	Rank Sum
Arts & Sciences n=(379)	Male	243	49,011	5 (2.1%)	28 (11.5%)	177 (72.8%)	27 (11.1%)	6 (2.5%)	0.000	0.000
	Female	136	38,000	0 (0%)	7 (5.1%)	122 (89.7%)	4 (2.9%)	3 (2.2%)		
	White	295	43,226	6 (2%)	24 (8.1%)	225 (76.3%)	29 (9.8%)	11 (3.7%)	0.152	0.956
	Minority	84	41,863	0 (0%)	7 (8.3%)	61 (72.6%)	9 (10.7%)	7 (8.3%)		
Business n=(116)	Male	80	66,524	1 (1.3%)	12 (15%)	53 (66.3%)	13 (16.3%)	1 (1.3%)	0.142	0.011
	Female	36	54,410	0 (0%)	7 (19.4%)	23 (63.9%)	4 (11.1%)	2 (5.6%)		
	White	96	64,561	1 (1%)	17 (17.7%)	62 (64.6%)	14 (14.6%)	2 (2.1%)	0.652	0.093
	Minority	20	69,771	0 (0%)	4 (20%)	11 (55%)	5 (25%)	0 (0%)		
Education n=(111)	Male	46	48,092	0 (0%)	5 (10.9%)	35 (76.1%)	5 (10.9%)	1 (2.2%)	0.087	0.008
	Female	65	42,144	0 (0%)	4 (6.2%)	58 (89.2%)	2 (3.1%)	1 (1.5%)		
	White	97	44,226	3 (3.1%)	9 (9.3%)	74 (76.3%)	8 (8.2%)	3 (3.1%)	0.000	0.411
	Minority	14	46,171	0 (0%)	0 (0%)	7 (50%)	5 (35.7%)	2 (14.3%)		
Engineering n=(90)	Male	77	61,051	1 (1.3%)	9 (11.7%)	58 (75.3%)	7 (9.1%)	2 (2.6%)	0.930	0.931
	Female	13	62,202	0 (0%)	1 (7.7%)	11 (84.6%)	1 (7.7%)	0 (0%)		
	White	58	61,739	1 (1.7%)	6 (10.3%)	42 (72.4%)	7 (12.1%)	2 (3.4%)	0.617	0.202
	Minority	32	58,004	1 (3.1%)	4 (12.5%)	25 (78.1%)	2 (6.3%)	0 (0%)		
Health & Public Affairs n=(124)	Male	60	47,823	0 (0%)	7 (11.7%)	43 (71.7%)	8 (13.3%)	2 (3.3%)	0.031	0.805
	Female	64	49,373	0 (0%)	5 (7.8%)	42 (65.6%)	11 (17.2%)	6 (9.4%)		
	White	97	48,116	0 (0%)	14 (14.4%)	69 (71.1%)	10 (10.3%)	4 (4.1%)	0.761	0.676
	Minority	27	48,692	0 (0%)	3 (11.1%)	20 (74.1%)	2 (7.4%)	2 (7.4%)		
Creol n=(18)	Male	16	77,018	0 (0%)	2 (12.5%)	12 (75%)	2 (12.5%)	0 (0%)	0.717	0.042
	Female	2	60,992	0 (0%)	0 (0%)	2 (100%)	0 (0%)	0 (0%)		
	White	11	74,160	0 (0%)	1 (9.1%)	9 (81.8%)	1 (9.1%)	0 (0%)	0.050	0.928
	Minority	7	68,533	0 (0%)	0 (0%)	2 (28.6%)	2 (28.6%)	3 (42.9%)		

* Shaded values are statistically significant at p=0.05

General Linear Model

The second approach was regression-based by rank and discipline. ANOVAs were run using a General Linear Model (GLM) regression model in SPSS. Salaries were evaluated as a 2X2 factorial design with gender and ethnicity as main factors. The interaction of gender and ethnicity were also examined. Main effects and interaction were tested at a α=.05 significance level. The GLM function is shown below.

- Salary =f(gender, ethnicity, gender x ethnicity)

The GLM analysis was conducted by pay plan by rank/level by college/department. Thus, there was the potential of analyzing 309 cells broken down as follows: 9-month faculty (six

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ranks by six colleges), 12-month faculty (ten ranks by fourteen colleges/administrative units), A&P (two levels, or HEW codes, by nineteen college/administrative units), and USPS (five levels by nineteen college/administrative units). Any cell that had at least one male and one female employee was analyzed for gender inequalities. Any cell that had at least one white employee and one minority employee was analyzed for ethnic inequalities. Furthermore, a Mann-Whitney Rank Analysis (Rank Sum Test) was conducted to determine if males (whites) had a significantly different median salary at each level (cell) than females (minorities). Again, caution was used as small sample sizes and large standard errors may mask practical differences.

The results of the GLM analysis for 9-Month Faculty can be found in red brackets in table 5 below. Overall, male 9-month faculty members have a higher average salary than female 9-month faculty members ($11,619) without taking into consideration rank and college. However, these are two critical factors that should be included when reviewing the results. When rank and college are taken into account, there are no significant differences between males and females. With respect to ethnicity, minority Associate Professors in Education have a higher average salary than Whites ($8,390), minority Assistant Professors in Education have a higher average salary than Whites ($7,079), and minority Assistant Professors in Health & Public Affairs have a higher average salary than Whites ($4,257).

Table 5

9-Month Faculty GLM and 10% Flag Results

	Professor		Assoc. Prof.		Asst. Prof.		Instructor		Lecturer		No Rank		Total	
Arts & Sciences									f	wm	m	mw	M [M]	
Business			F	MW									M	MW [MW]
Education				mw [MW]		MW [MW]							M [M]	
Engineering														
Health & Public Affairs	f	mw				[MW]								
Creal													m	
Total						[MW]			f	wm	m	mw	M [M]	

MW=Minorities have higher salary than Whites; WM=Whites have higher salary than Minorities

* Data in red text, within brackets, designates a statistically significant difference at .05 significance level; Data in black text, without brackets, designates a "flag" whereby on a pairwise basis the difference exceeds 10% of the pairwise average salary; Lowercase designation was used for the flags if at least one group in the pairwise comparison had an n-size of 5 or less.

10% Flag

At the micro level, there were many cases where the n-size was small (5 or fewer cases). Statistical significance is affected greatly by large variances and small sample sizes and limits the ability to identify significant differences. Thus, a third approach used a "10% flag". The "flag" was utilized to designate where the difference in average salary for both groups (males and females) was greater than 10% for the average salary for both groups.

$$|\mu a - \mu b| > 0.1\ \mu T$$

10% is an arbitrary number that must be agreed upon. However, 10% looked to be a reasonable number with this university's data. This approach is a non-statistical parallel to the GLM/ANOVA approach discussed above. This analysis was conducted at the same level as discussed under the GLM approach, pay plan by rank/level by college/division.

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Furthermore, similar to the Chi Square tests conducted using the regression results, for each level in the microanalysis (e.g. Professors in Arts & Sciences), individuals were characterized as having an actual salary 10% below, within 10%, or 10% above the weighted average salary for that level. A Chi Square test was conducted on these distributions to determine if males (whites) had a significantly different distribution than females (minorities) at each level.

Table 5 above, displays the results of the 10% flag in black, without brackets. Lowercase designation was used for the flags if at least one group in the pairwise comparison had an n-size of 5 or less (e.g., wm). Gender differences appear in 4 of 24 cells, with males higher in 1 (4%) and females in 3 (13%). Ethnic differences appear in 6 of 21 cells, with whites higher in 1 (5%) cell and minorities higher in 5 (24%). Specifically, females were paid higher as lecturers in Arts & Sciences, Associate Professors in Business, and Professors in Health & Public Affairs, while males with no rank were paid higher in Arts & Sciences. Minority 9-Month Faculty were paid higher with no rank in Arts & Sciences, as Associate Professors in Business and Education, as Assistant Professors in Education, and as Professors in Health & Public Affairs, while white lecturers were paid higher in Arts & Sciences.

Synthesis

A top down approach was used to synthesis the results of the three approaches. The t-test of the average residuals for each regression analysis was reviewed and those with significant t-tests were identified as areas of concern. For those areas, the GLM significance tests and 10% flags were reviewed in order to more accurately pinpoint the areas with potential salary discrepancies based on gender or ethnicity. For example, the t-test for the 12-month faculty Academic 1 regression model was significant. In order to have large enough samples to run a regression analysis, three of the colleges had to be grouped together. So, the GLM and 10% flag analyses were reviewed for those colleges that made up the 12-month faculty Academic 1

regression model. The GLM and 10% flag were significant for Instructors in the College of Business Administration. So, the recommendation would be for administration to review all instructors in the College of Business Administration.

Specifically for 9-Month Faculty, the P-C Regression model residual analysis suggests that female faculty are paid more in Health & Public Affairs and minority faculty are paid more in Arts & Sciences, Education, and CREOL. The female distribution of residuals is skewed left in Health & Public Affairs and the minority distribution is skewed left in Education and CREOL. The GLM/ANOVA model suggests that minority Associate Professors in Education and Assistant Professors in Education and Health & Public Affairs have a higher average salary than white colleagues. The 10% Flag analysis indicates that female faculty are paid higher than male faculty (3:1) in 4/24 cases (Females lecturers in Arts & Sciences, Associate Professors in Business, Professors in Health & Public Affairs, and males with no rank in Arts & Sciences) and minority faculty are paid higher than white faculty (5:1) in 6/21 cases (Minorities with no rank in Arts & Sciences, Associate Professors in Business and Education, Assistant Professors in Education, Professors in Health & Public Affairs, white lecturers in Arts & Sciences). The conclusion is that no evidence of inequity for female and minority faculty was found in the 9-Month Faculty pay plan.

Additional Results

Although, the data for the other three pay plans were not discussed in detail in this paper, the table below summarizes the results of the Regression analyses residual tests.

Table 6

Regression Summary by Pay Plan

	Gender	Ethnicity
9 Month Faculty		
Arts & Sciences		M
Business		
Education		M
Engineering		
Health & Public Affairs	F	
Creol		M
12 Month Faculty		
Academic 1 (COB, CECS, CREOL)	(M)	(W)
Academic 2 (A&S, COE, HPA)		
Administrative 1 (Academic Affairs, Research, Area Campuses)	(M)	
Administrative 2 (Library & Information Resources, Athletics, Student Services, Foundations, All Others)		
A&P		
Academic (A&S, COB, COE, CECS, HPA, CREOL)	(M)	
Administrative 1 (Research, Athletics, Student Services, Area Campuses, Police/Environmental Safety, All Others)		
Administrative 2 (Academic Affairs, Physical Plant, Finance/Accounting/Human Resources, University Relations, Library & Information Resources, Business Services, Foundations)		M
USPS		
Academic (A&S, COB, COE, CECS, HPA, CREOL)		
Administrative 1 (Physical Plant, Finance/Accounting/Human Resources, Athletics, Student Services, Business Services, Area Campuses, All Others)	(M)	(W)
Administrative 2 (Academic Affairs, University Relations, Research, Library & Information Resources, Foundations, Police/Environmental Safety)		

Four groups were identified for further analysis due to gender inequalities and two groups were identified due to ethnicity inequalities. The GLM and 10% flag analysis were used to help narrow down the location of the potential problem areas, within their respective regression groups. Specific target areas identified by pay group follow.

For 12-Month Faculty, it is recommended that individual "Instructor" and "no rank" salaries in College of Business Administration be reviewed. Assigned faculty rank may not be commensurate with assigned responsibilities. Furthermore, female "Professor" salaries in Academic Affairs and Research, and "no rank" female faculty in Research and Area Campuses should be reviewed. For A&P employees, individual female salaries at the Executive/Managerial level in College of Arts & Sciences, College of Education, and College of Engineering & Computer Science and Professional Non-Faculty in College of Business Administration, College Of Education, College of Engineering and Computer Science, and CREOL should be reviewed. For USPS female salaries at the Professional Non-Faculty level in Finance/Accounting/Human

Services, Student Services, and All Others, at the Technical/Paraprofessional level in Physical Plant, Business Services, and All Others, at the Skilled Craft level in Business Services, and at the Service/Maintenance level in Student Services should be reviewed. Individual minority employee salaries at the Professional Non-Faculty level in Physical Plant and Business Services, at the Technical/Paraprofessional level in All Others, at the Service/Maintenance level in Physical Plant, Student Services and All Others, and at the Skilled Craft level in Physical Plant should be reviewed.

Conclusions

No causes for concern existed for 9-Month Faculty. However, "inequalities" were identified in Administrative and Staff categories. Using this multifaceted approach, we were able to target specific divisions and rank/levels where inequalities exist. No in-depth statistical analysis of causes for these differences was possible. It was recommended that an appropriate group be identified to further analyze these groups with respect to individual history, performance measures, and other relevant factors that could not be captured in this analysis in order to establish if there are any inequities.

It is recommended that this methodology be adopted as standard practice and conducted annually to spot potential problem areas before they become areas of contention. In order to be able to use factors not previously available, such as individual history and performance measures, it is recommended that a salary database be created for general analysis use. Furthermore, the classifications required for OFCCP studies need to be researched and methodology adapted if necessary. Finally, it is recommended that an external comparative analysis be conducted using external (SUS, MRU peers) benchmarks and local market factors.

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